



Guppya sterkii (Dall, 1888) (Gastropoda, Eupulmonata, Euconulidae) in eastern Ontario, Canada

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Abstract

A seldom-collected terrestrial snail, *Guppya sterkii* (Dall, 1888), is recorded for the first time from an older-growth hardwood forest in rural Ottawa, eastern Ontario. This represents a range extension of roughly 175 km north-east of the nearest previously known occurrence. Its conservation status and possible threats are briefly discussed.

Key words

Land snail; Mollusca; range extension; leaf litter; earthworms; Mixedwood Plains ecozone.

Academic editor: Leonardo Santos de Souza | Received 16 April 2018 | Accepted 19 June 2018 | Published 13 July 2018

Citation: Forsyth RG, Nicolai AN (2018) *Guppya sterkii* (Dall, 1888) (Gastropoda, Eupulmonata, Euconulidae) in eastern Ontario, Canada. Check List 14 (4) 579–583. <https://doi.org/10.15560/14.4.579>

Introduction

Historically, the molluscs of the Ottawa region were rather well enumerated by early members of the Ottawa Field-Naturalists' Club, as well as later researchers, who reported on highlights from collecting activities, prepared lists, and issued updates (e.g., Heron 1880, Latchford 1887, La Rocque 1931). Among the species that they found were a number of rarities at the national, provincial, or regional level. No discussion of the history of the biogeography of terrestrial molluscs in Ontario can be complete without the mention of the landmark publication of Oughton (1948), who mapped the distributional ranges of land snails and slugs in the province. More recently, however, little has been done since to survey for terrestrial snails in the Ottawa region. Although the late malacologist F. Wayne Grimm lived near Ottawa for several decades, his focus was mostly on larger snails (R. Forsyth pers. observ.). Despite previous interest in terrestrial molluscs in eastern Ontario, it is still possible to find

previously unrecorded species in the region (e.g., Forsyth and Oldham 2014) within the remnants of old-growth hardwood forests in this region.

The minute terrestrial snail *Guppya sterkii* (Dall, 1888) (Gastropoda, Eupulmonata, Euconulidae) went unrecorded from the Canadian fauna until the extensive and careful survey work in Ontario terrestrial molluscs by John Oughton (1948), although there is an undated record, perhaps earlier, collected by A.W. Andrews and originally part of the Bryant Walker collection. The majority of these collections are now housed in the University of Michigan Museum of Zoology (UMMZ), but some duplicate specimens were returned to the Royal Ontario Museum (ROM), from where Oughton's collections originated. Oughton or his associates had found *G. sterkii* from likely 10 sites, from river drift, leaf litter samples, and post-glacial deposits. His northernmost and easternmost record was from north of Peterborough, Peterborough County (Fig. 1, Table 1), and he speculated that this species is

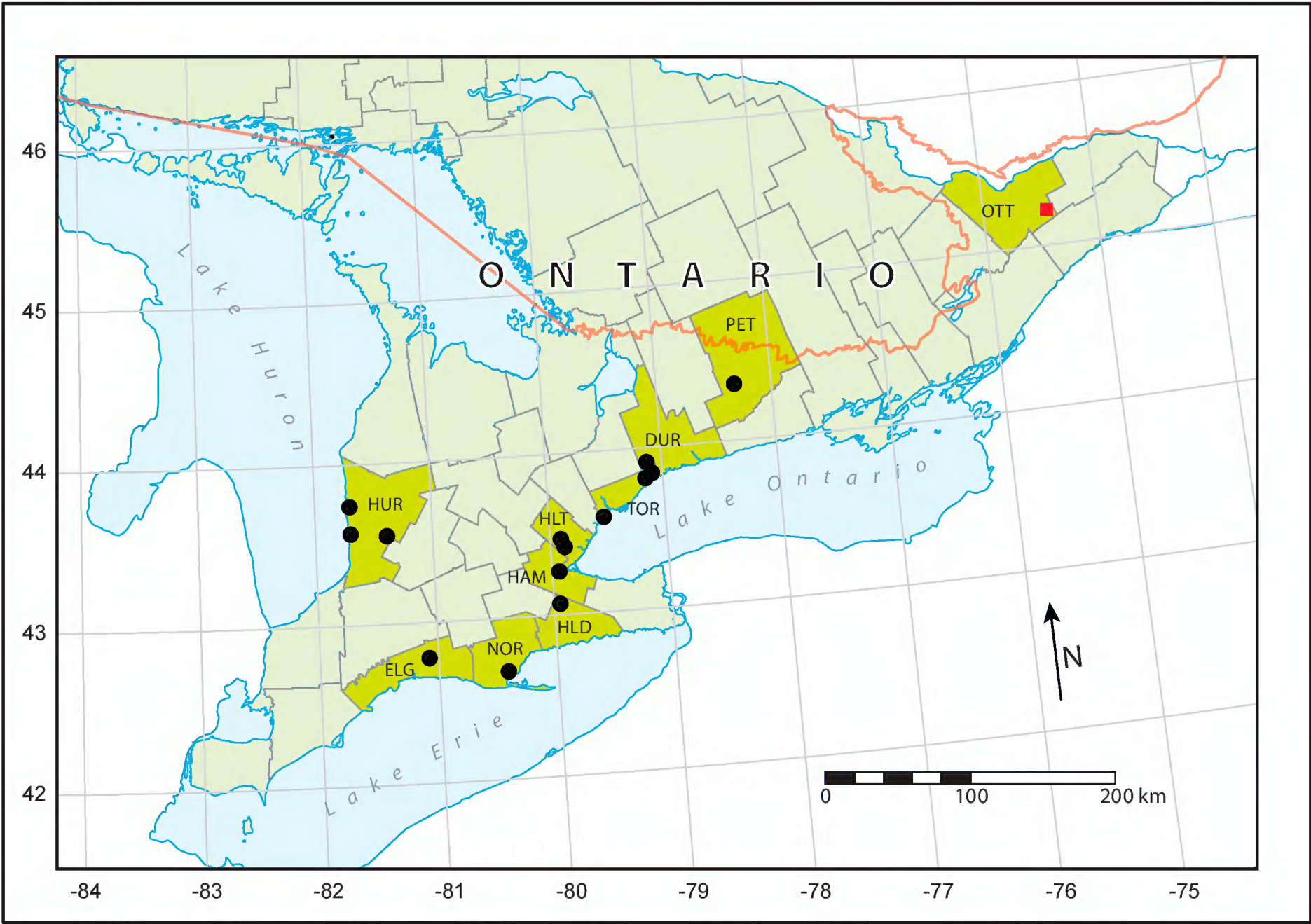


Figure 1. Occurrences of *Guppya sterkii* in southern Ontario, Canada: black circle = historical records (Table 1); red square = new record. County/regions: DUR = Durham, ELG = Elgin, HAM = Hamilton, HLD = Haldimand, HLT = Halton, HUR = Huron, NOR = Norfolk, OTT = Ottawa, PET = Peterborough, TOR = Toronto. Orange line = northern border of Mixedwood Plains Ecozone.

Table 1. Historical records of *Guppya sterkii* in Ontario. See Methods for collection acronyms.

| Collection | Number | County [†] | Locality | Collector [‡] | Date | Latitude [§] | Longitude [§] |
|------------|--------|----------------------|--|--------------------------|------------|-----------------------|------------------------|
| ANSP | 176577 | Ontario [Durham] | Pickering | J. Oughton | 1937-6-9 | 43.91 | -079.13 |
| ROMIZ | 14933 | Huron | Seaforth | J. Oughton | 1940-10-30 | 43.55 | -081.39 |
| ROMIZ | 20352 | Toronto | Rouge R., 1 mi. N of Kingston Highway | J. Oughton | 1937-5-12 | 43.81 | -079.15 |
| ROMIZ | 12819 | Wentworth [Hamilton] | Dundas | J. Oughton | 1938-4-16 | 43.27 | -079.94 |
| ROMIZ | 14431 | Norfolk | St Williams | J. Oughton | 1940-8-26 | 42.67 | -080.42 |
| ROMIZ | M14596 | Halton | Milton: Rattlesnake Point: Concession 5, Lot 11-12 | M. McMillan | 1998-9 | 43.47 | -079.91 |
| ROMIZ | M14595 | Halton | Burlington: Mount Nemo: Concession 4, Lot 12-14 | M. McMillan | 1998-9 | 43.42 | -079.88 |
| UMMZ | 179957 | York [Toronto] | Long Branch | J. Oughton | 1937-4-7 | 43.35 | -078.32 |
| UMMZ | 179958 | Huron | Seaforth | J. Oughton | 1940-10-30 | 43.55 | -081.39 |
| UMMZ | 179956 | Peterborough | 3 mi. N of Peterborough | P.M. Oughton; J. Oughton | — | 44.35 | -078.32 |
| UMMZ | 179955 | Wentworth [Hamilton] | Dundas | J. Oughton | 1938-4-16 | 43.27 | -079.94 |
| UMMZ | 179954 | Ontario [Durham] | Pickering, near lake | J. Oughton | 1937-6-19 | 43.84 | -079.09 |
| UMMZ | 179953 | Haldimand | Caledonia | H.S. Troyer | 1941-4-18 | 43.07 | -079.95 |
| UMMZ | 179952 | Elgin | New Sarum | T. Kurata; J. Oughton | 1937-5-14 | 42.78 | -081.08 |
| UMMZ | 179959 | Huron | Near mouth of Bayfield River, Bayfield | H.S. Troyer | 1940-10-30 | 43.57 | -081.70 |
| UMMZ | 122046 | Huron | Goderich | A.W. Andrews | — | 43.74 | -081.70 |

[†] Current names of the regions or cities replacing several counties are given in brackets.
[‡] Collectors' surnames names, not always present in collection data, are added here from Oughton (1948: vi).
[§] Latitude and longitude are approximate, here derived using an online database of geographical names (Natural Resources Canada 2018) or Google Earth Pro v. 7.3.1.4507 (Google Inc.).

likely widespread in the Great Lakes region of southern Ontario (Oughton 1948). Other than material collected in the late 1990s as part of a study investigating the effects of rock climbing on snail faunas of cliffs along the Niagara Escarpment in Burlington and Milton, Ontario (McMillan et al. 2003), there appear to be no other recent collections of this species made in the province. Here, we document collections of *G. sterkii* from the Ottawa region of eastern Ontario. The new records represent a small range extension of roughly 175 km east from a historical record near Peterborough, the nearest previously known occurrence of *G. sterkii* in Ontario.

Methods

In 2016, we made collections of terrestrial snails in and around Ottawa, Ontario, with our focus on finding new records for species at risk and otherwise rarely seen or not recently found species. In earlier years, one of us (RGF) had made some incidental collections in the region. To find minute, litter-dwelling snails, including *Guppya sterkii*, handfuls of moist leaves and a small amount of the more decomposed layer below were gathered from places where litter was deepest, such as in hollows and against logs and large rocks.

The specific site of the new records below is a private woodlot in a rural part of the city of Ottawa, near Metcalf. The forest there is Carolinian, composed of species of hardwoods, some of which just barely enter Canada in southern Ontario. This part of the province is within the Mixedwood Plains Ecozone, a region of important terrestrial mollusc diversity in Canada (Forsyth and Oldham 2014), but one that is heavily impacted by human activities since colonization.

In 2014, 2 litter samples were taken over a broad area, but in 2016, individual samples from 3 areas in the woods were individually sampled. Volumes of litter were not carefully controlled but samples were approximately 2 L in volume. The samples were later dried and sieved to remove coarse material. The resulting fine material included soil, small fragments of leaves and other organic debris, and minute snails, which were removed by careful sorting under a stereomicroscope. Geographic coordinates were recorded using a Garmin eTrex Vista HC GPS receiver using the WGS84 datum.

All specimens were deposited in the mollusc collection of the New Brunswick Museum (NBM), Saint John, New Brunswick, Canada. The following collections have historical records of *G. sterkii* from Ontario: Academy of Natural Sciences of Drexel University (Philadelphia, Pennsylvania, USA; ANSP); Royal Ontario Museum, Invertebrate Zoology (Toronto, Ontario; ROMIZ); and University of Michigan, Museum of Zoology (Ann Arbor, Michigan, USA; UMMZ).

Species of snails were identified using the monograph of Pilsbry (1939–1948); *G. sterkii* appears in volume II, part 2 of Pilsbry's (1946) monograph. Whorls were counted, to the nearest $\frac{1}{4}$ whorl, by the method of Kerney

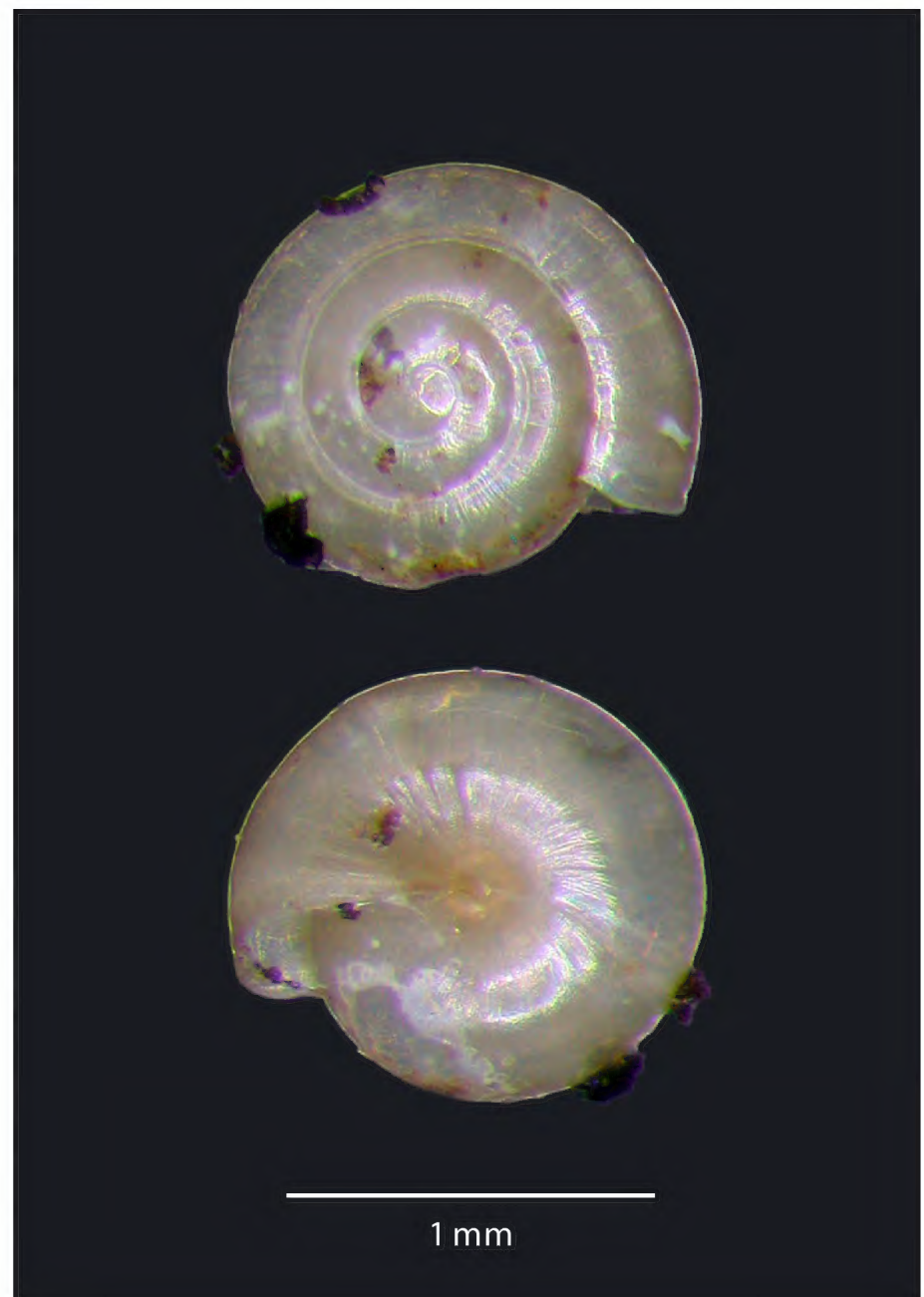


Figure 2. *Guppya sterkii*, woodlot on 9th Line Road, ca 2.6 km SSE of intersection with Victoria Road, near Metcalf, Ottawa, Ontario (NBM 010007, largest specimen).

and Cameron (1979). A shell was photographed with a digital camera (Nikon Coolpix E995) mounted on a Russian stereomicroscope (model M6C-10). Multiple images were focus-stacked using Helcion Focus v. 5.2 (Helcion Soft Ltd).

Results

Guppya sterkii (Dall, 1888)

Hyalina sterkii Dall 1888: 214, figs 1–3.

Guppya sterkii—Pilsbry 1946: 245–246, fig. 121. Hubricht 1985: 33, map 334.

Euconulus sterkii—Oughton 1948: 20, map.

Figure 2

New records. Canada: Ontario: Ottawa region: near Metcalf: private woodlot on 9th Line Road, ca 2.6 km SSE of intersection with Victoria Road (ca 45.2219, –075.4411), leg. R.G. Forsyth & P.M. Catling, 24 Sept. 2014 (NBM 010007, 10 spec.). Ibid. (45.2231, –075.4418), leg. R.G. Forsyth, A. Nicolai, & P.M. Catling, 25 Aug. 2016 (NBM 010008, 4 spec.). Ibid. (45.2219, –075.4411), leg. R.G. Forsyth, A. Nicolai, & P.M. Catling, 25 Aug. 2016 (NBM 010009, 2 spec.).

Of the 3 leaf litter samples taken in 2016, *G. sterkii* was found in 2 of them. The first was around a large glacial erratic with deep litter (6 spp. of snails including *G. sterkii*); the second was an upland area with moister

depressions (10 spp., including *G. sterkii*). The third sample, from a relatively drier upland area, did not include this species (4 spp.). Altogether, in all years and in all areas of the woods, we found 16 other terrestrial snails (Table 2).

Identification. Shell minute, to 1.3 mm in diameter, thin, translucent, very pale, nearly colourless (Fig. 2). Spire low, conical. Whorls rather closely coiled, largest shells with ca 3–3½ whorls. Periphery rounded, medial. Base flattened, slightly hollowed out in the umbilical area. Umbilicus closed. Aperture broadly crescent-shaped, edentulate. Outer lip thin, simple. Protoconch with microscopic spiral striae. Teleoconch with microscopic spiral striae and weak, irregular incremental growth wrinkles.

No other species of terrestrial snail in Canada resembles *G. sterkii*, and certainly not any species in Ontario. Species of *Euconulus* Reinhardt, 1883 are larger (when fully grown), yellowish- to reddish-brown, and with sharper sculpture (close collabral threads on apical surface of whorls; spiral striae on base). As Oughton (1948) noted, it may be mistaken for the immature of other species because of its size.

Discussion

The new, eastern Ontario record is roughly 175 km northwest of Peterborough, one of Oughton’s (1948) localities (Fig. 1). Based on Hubricht (1985), the nearest occurrence in the USA is in Onondaga County, New York, approximately 230 km or more south-southeast of the Ottawa site. The new records, like all others so far from Ontario, are within the Mixedwood Plains ecozone (Fig. 1).

Guppya sterkii is one of the smallest terrestrial snails in Canada, with adult shells not exceeding 1.3 mm (Oughton 1948). As such, it seems probable that it is underrepresented in collections, as visual searches in the

field are unlikely to find this microsnail. Oughton (1948) was the first to find this species in Ontario, but he may have also been the first to collect microsnails by sorting through leaf litter and drift samples. Most earlier collectors in Ontario, prior to Oughton, did not record their methodology for collecting, but we presume that they utilized only field-based visual searches. More recently, avid collectors of land snails, such as the late F. Wayne Grimm (collection now in the Canadian Museum of Nature, Gatineau, Quebec) and Michael Oldham (Natural Heritage Information Centre, Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario) had not found *G. sterkii*. Since Oughton, this species has seldom been found (Table 1), but its collection is highly dependent on suitable methods.

The NatureServe conservation rank of *G. sterkii* in Ontario is S1S3 (NatureServe 2017), which means that there is uncertainty in the rank, ranging from Critically Imperiled (S1) to Vulnerable (S3). Our 2016 fieldwork within the Ottawa region and in adjacent Quebec (Gatineau Park), surveyed 7 other forested sites using the same methodology of leaf litter collection. At these sites, *G. sterkii* was not detected and presumed absent. It might be that *G. sterkii* is truly rare in the Ottawa region, at the northern edge of its range. As we have not yet taken leaf litter samples from southwestern Ontario forests, we do not know how widespread or common this species is there.

Throughout southern Ontario, forests have been in decline since the first European colonists settled and cleared the land. In much of this area, mature deciduous forests are now mostly small, isolated fragments. It seems likely that at some of the historical sites of *G. sterkii* in Ontario no longer exist; for example, Long Branch, now within the City of Toronto, must have appeared a lot different in the 1930s when Oughton collected his material.

Table 2. Terrestrial snail species found within the study area, a woodlot on 9th Line Road, ca 2.6 km SSE of intersection with Victoria Road, near Metcalf, Ottawa, Ontario in 2014 and 2016. Voucher specimens of all species but 1 have been deposited in the New Brunswick Museum.

| Family | Species | NBM catalogue number(s) |
|-----------------|--|--|
| Succineidae | <i>Novisuccinea ovalis</i> (Say, 1817) | 010251, 010274, 010290 |
| Ellobiidae | <i>Carychium exile</i> H.C. Lea, 1842 | 010266, 010278, 010281 |
| Gastrocoptidae | <i>Gastrocopta contracta</i> (Say, 1822) | 010258, 010286 |
| | <i>Gastrocopta pentodon</i> (Say, 1822) | 010263, 010277 |
| Vertiginidae | <i>Vertigo bollesiana</i> Morse, 1865 | 010264 |
| | <i>Vertigo gouldii</i> A. Binney, 1843 | 010265, 010269 |
| Strobilopsidae | <i>Strobilops labyrinthicus</i> (Say, 1817) | 010261, 010289 |
| Euconulidae | <i>Euconulus polygyratus</i> (Pilsbry, 1899) | 010257, 010268, 010273, 010283, 010287 |
| | <i>Guppya sterkii</i> (Dall, 1888) | See Results |
| Haplotrematidae | <i>Haplotrema concavum</i> (Say, 1821) | 010252 |
| Helicodiscidae | <i>Helicodiscus parallelus</i> (Say, 1817) | 010256, 010272, 010285 |
| Discidae | <i>Anguispira alternata</i> (Say, 1816) | — |
| Punctidae | <i>Punctum minutissimum</i> (L. Lea, 1841) | 010260, 010276 |
| Pristilomatidae | <i>Paravitrea multidentata</i> (A. Binney, 1841) | 010253, 010271 |
| Gastrodontidae | <i>Striatura exigua</i> (Stimpson, 1850) | 010262, 010270, 010279, 010284 |
| | <i>Striatura ferrea</i> (Morse, 1864) | 010255, 010275 |
| | <i>Striatura milium</i> (Morse, 1859) | 010259, 010280, 010282 |
| | <i>Zonitoides arboreus</i> (Say, 1817) | 010254, 010267, 010288 |

However, forest remnants in southern Ontario, as well as many in the Ottawa region, show clear evidence of degradation of the forest-floor organic layer (O horizon), caused, we are most certain, by earthworms, of which the majority are invasive European species (Addison 2009). This reduction and even total elimination of the O horizon is now linked to invasive earthworms (e.g. Hale et al. 2008). In most forests that we have visited, there are clear signs of extensive earthworm activity, with many castings, a mixture of organic with mineral soils, and greatly reduced leaf litter. In some places, there is more exposed earth than litter in forests that should have abundant leaf litter. While there has not yet been direct connection made between loss of snail faunas with overabundance of invasive earthworms, some have suggested a connection (Norden 2010, Forsyth et al. 2016), and for litter-dwelling microsnails, the persistence year-round of the microhabitats afforded by a quality leaf litter layer is paramount. Without this, they likely cannot survive. At the Ottawa forest where we found *G. sterkii*, there were earthworms but the disturbance was only moderate.

Thus, the possible natural rarity of *G. sterkii*, a short supply of intact forests, and a degradation or elimination of leaf litter on the forest floor are the expected threats to *G. sterkii*. However, because of its minute size, the possibility of detection of this species makes surveys difficult and time-consuming.

Acknowledgements

We thank Maureen Zubowski (Royal Ontario Museum) and Taehwan Lee (University of Michigan Museum of Zoology) for their help with data on historical collections, Paul Catling for access to his woodlot and for assistance with collecting our samples, and Mary Sollows and Donald McAlpine (New Brunswick Museum) for assistance with depositing our collections. This study was supported in part by the Canadian Field-Naturalists' Club (Ottawa, Ontario) and by the New Brunswick Museum. We thank the editor and the 2 reviewers, Jochen Gerber and Barry Roth, for their constructive comments on an earlier version of this manuscript.

Authors' Contributions

Both authors collected the leaf-litter samples; RGF sorted the litter samples, extracted specimens, and identified

species. RGF prepared the figures and wrote the first draft of the manuscript for review and revision by AN. Both authors were involved with revising the manuscript.

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